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Structure of 1-Alcohol Monolayers Adsorbed at the Water-Hexane Interface

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Beamline(s): X19C

We report a study of monolayers of $CH_3(CH_2)_{n-1}OH$ for n=20, 22, 24, and 30 at the water-hexane interface by the methods of x-ray scattering and interfacial tension. This study demonstrates the monolayer nature of the adsorbed films. A significant amount of water is embedded into the structure near room temperature ($2C_n$-alcohol: $3H_2O$). The area per molecule in the adsorbed monolayers is $A \approx 24 \times 10^{-20} m^2$, higher than for insoluble 1-alcohol monolayers on the surface of water (see Ref.1, 2). The interfacial tension as a function of temperature indicates a phase transition at the interface that occurs with a large change in surface entropy $\Delta S \approx 2$ mJ $K^{-1}m^{-2}$. The critical temperature of the transition depends upon the bulk concentration of the 1-alcohol in hexane. In the high temperature state the water-hexane interface has an interfacial width ($\sigma \approx$ 0.5 nm) greater than expected from capillary wave roughness. Near the critical temperature, strong diffuse scattering indicates the presence of inhomogeneities at the interface.

References:

1. B. Berge, A. Renault, Europhys. Lett, **21**, 773 (1993).
2. J. P. Rieu and *et. al.,* J. Phys. II, **5**, 607 (1995).

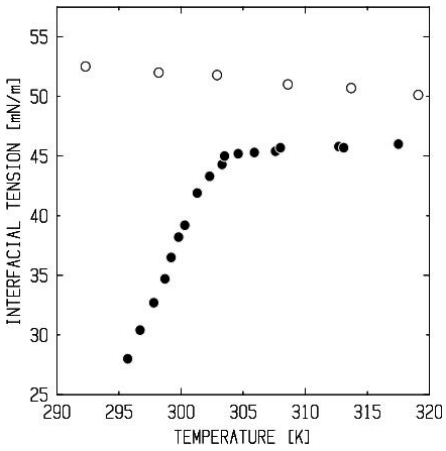

Figure 1. Tension of the water-hexane interface. Open circles are for the clean water-hexane interface; dots are for the adsorbed C_{24}-alcohol monolayer.

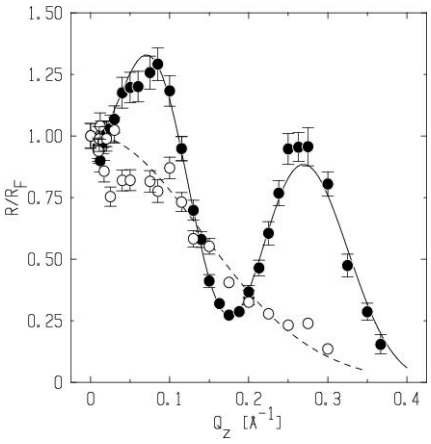

Figure 2. The reflectivity divided by Fresnel reflectivity for the water-hexane interface with adsorbed molecules of C_{24}-alcohol: dots, T=294.8 K; open circles, T=318.8 K.